



The Double Helix: A Personal Account of the Discovery of the Structure of [the Information Professional's] DNA¹

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This paper will discuss a research project that identifies the skills, knowledge and attitudes of the archetypal information professional for the twenty-first century. Participants in the study include library and information professionals, educators and students from South East Queensland. Focus groups were used for data collection. In the field of genetics it is commonly accepted that every individual (apart from identical twins) has a unique pattern of DNA. This pattern determines the characteristics and qualities that a person possesses. The current research project aims to extrapolate the concept of 'unique patterns of DNA' to determine the specific characteristics and qualities of the information professional. Building on the double helix image of human DNA, the DNA of the information professional consists of two intertwined and complementary strands. These strands incorporate discipline knowledge and generic capabilities, which together make up the genome of the successful information professional in the information age. The paper will provide a discussion on the preliminary findings that have emerged from the research in these two areas. The research is significant because it establishes an open dialogue between current industry professionals, library science educators and the professional association on the traditional and evolving skills and knowledge required by information professional in the twenty-first century. The dialogue will guide the development of current and future education of library and information professionals.

Introduction

In 2003 Barbara Lovato-Gassman stated "it takes an extraordinary worker to become a successful professional librarian in the 21st century" (p.47). The rationale for this statement is quite simple - the nature of library and information work is continually changing. As these changes continue to take place it is essential that the library and information industry take stock of what knowledge and skills are required by modern day librarian or information professionals to be successful within their new roles and responsibilities and the changing marketplace. This paper will outline a research project aimed at identifying the skills and knowledge required by the successful library and information professional in the twenty-first century. The paper will provide a discussion on the preliminary skills and knowledge framework that can be used to guide the current and future Library and Information Studies (LIS) education.

The Library And Information Professional For The Twenty First Century

In April this year Phil Teece noted "the last twenty years have seen huge changes in libraries. The arrival of the 'information age' has spawned new tasks. The expectations of library users have soared. Budgets have contracted sharply. Workforces have been cut. Duties have been redistributed. One of the most obvious results has been the rise of the para-professional. Library technicians are now routinely doing quite complex work formerly seen as exclusively the province of professional librarians" (Teece, 2004, p. 24). In short, Teece is suggesting that new and fundamental changes to the roles and responsibilities of the

librarian have emerged. The librarian of the twenty-first century has a new identity. The identification and definition of the key skills and knowledge, which are specific to the newly emerging modern day library and information professional, are therefore critically important. Speculations and suggestions about the skills and knowledge required by the library and information professional in the future have begun to emerge in the last few years (Fisher, 2002; Middleton, 2003; Myburgh, 2003). Skills and knowledge that are frequently mentioned include those of information management, information resources, information access, research, communication, teamwork and project management. According to Anne A Salter (2003), "the librarian of the 21st century will be the product of what we observe about ourselves and the critical self-analysis that follows" (p. 53). Salter argues that we, as a profession, must not be afraid to ask "hard deeply intense, if not disturbing questions, about our profession in order to fully understand and formulate our new image" (p. 54). Salter concludes, "the librarian of the future is perhaps a professional who will no longer bear the name librarian. It is a professional who encompasses a set of standards and values that operate smoothly and seamlessly in a technology driven environment. It is a professional who has a clear understanding of and appreciation for the traditions of librarianship. It is a professional who is multifaceted and multitasked. It is a professional with the characteristics of willingness to change; varied experience in training and background; adaptability to a quickly changing environment; 'shareability' between disciplines; and commitment. It is, finally, a professional we will not recognise as a librarian in the usual sense. If we do, then we have failed to evolve" (Salter, 2003).

The Research Project

The Research Aim

The research project explores the core characteristics required by the successful modern day library and information professional. The main aim of the research is to identify and examine the skills and knowledge essential for the successful library and information professional in the twenty-first century. This will be achieved by considering two research questions:

1. What are the generic capabilities required by the Library and Information Professional for the twenty-first century?
2. What is the discipline knowledge required by the Library and information Professional for the twenty-first century?

Research Approach

A two-fold approach was used for data collection.

1. A Review of current literature

Existing literature relevant to the research project was examined. In the area of generic capabilities this included the fields of higher education, human resources management, and library and information studies. In addition, materials published by the professional library and information associations nationally and internationally were studied. In the area of discipline knowledge this included an exploration of the literature in the library and information profession as well as an examination of the courses and curriculum offered by over 75 institutions for higher education in Australia, New Zealand, the United States of America, Canada and the United Kingdom. The latter was achieved by reviewing the course offerings presented on the websites provided by the institutions. One of the most significant points to emerge from the review of current literature was the absence of any list or exhaustive discussion on the generic capabilities of the information professionals. In regards to LIS Discipline knowledge the opposite was true with a plethora of lists and or discussions on the core knowledge required by the modern day LIS professional. Of particular note is the semantic difference used within the lists and the discussions to refer to similar concepts. The challenge has been to smoothly blend the LIS discipline literature together by eliminating repetitive areas without destroying any subtle nuances or differences. The data obtained from the literature review were collated and summarised into initial 'lists' of skills and knowledge within the two distinct areas of generic capabilities and discipline knowledge. The terminology and definitions (i.e. the names of the generic capabilities and discipline knowledge and associated descriptions) used in the lists were extracted from the literature reviewed.

2. Focus Groups

Focus groups were used for data collection as they allow for the gathering of qualitative data through "carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment" (Krueger, 1994 p. 6). Krueger goes on to suggest that focus groups are effective because they tap into the human tendency to develop "attitudes and perception relating to concepts, products, services, or programs...by interaction with people" and that "many people need to listen to opinions of others before they form their own personal viewpoints". This view is also shared by Stewart and Shamdasani (1990) who stated, "focus groups allow respondents to react to and build

upon the responses of other group members. This synergistic effort of the group setting may result in the production of data or ideas that might not have been uncovered in individual interviews" (p. 16). Focus groups are an appropriate choice for the current study because of their ability to produce concentrated amounts of data on precisely the topic of interest (Morgan, 1997, p. 13) and because there is the "opportunity for the clarification of responses and for follow up questions. The researcher can also observe body language, which may be as informative as the verbal responses" (Williamson, 1992, p. 257). According to Stewart and Shamdasani (1990) "the researcher can obtain deeper levels of meaning, make important connections, and identify subtle nuances in expression and meaning" (p. 16). All of the above, however, must be viewed in the light of the inherent limitations associated with the focus group technique, including the small number of respondents that participate, the limitations on generalisability to a larger population, the bias of the researchers/moderators influence and interests. Every effort will be made to strengthen the advantages and to limit the disadvantages of the survey method.

Eleven 2-hour Focus Group sessions were held. Each session included between 6 and 11 participants. Two moderators were involved in conducting the sessions. The Principal Moderator took on the role of 'discussion leader'. In this role the Principal Moderator welcomed the participants and facilitated the discussion. The Support Moderator took on a more technical role. In this role, the Support Moderator co-ordinated the audio recording of the session and observed the group dynamics providing feedback to the Principal Moderator on the group process. The inclusion of two moderators in the running of the sessions ensured that the process ran smoothly, as the Principal Moderator was able to focus on the intellectual content and the Support Moderator on the technical aspects of running the sessions. Both Moderators contributed to ensuring that a permissive, non-threatening environment was created "by not making judgements about responses or communicating approval or disapproval through body language, and through encouraging alternative explanations" (Williamson, 2002, p. 256).

All sessions were audio recorded. Full ethics clearance was obtained from the QUT Ethics Committee and all participants were informed about the recording procedure when initially invited to participate in the sessions and again at the commencement of the focus group. Participants were provided the opportunity to ask clarification about the project at any time and encouraged to make honest responses. The focus groups were presented with the initial findings obtained from the literature review. To assist this process a discussion aid was used. For example, the focus groups looking at generic capabilities were provided with a one-page handout briefly outlining the 10-workplace skills identified in the literature. Participants were invited to examine the list. The focus groups began with a broad question: *Are these the skills and knowledge required by the Library and Information Professional for the twenty first century?* Under the guidance of the Primary Moderator the group was guided through the entire list inviting comments and questions. The sessions ended with the participants being invited to provide comment on any skills or knowledge that may have been omitted but which should be included on the initial list.

Research Participants

According to Stewart and Shamdasani (1990) the “individuals who are invited to participate in a focus group must be able and willing to provide the desired information and must be representative of the population of interest. Thus, the selection and recruitment of participants for a focus group is a critical task” (p. 51). As this research aims to explore the skills and knowledge required by the successful library and information professional in the twenty-first century, it was important for the study to include participants who represented the many LIS sectors. Participants for the current research project were drawn from: public, State, academic, government and special libraries, LIS education and LIS employment services, from different areas of South East Queensland, and were employed in a variety of roles, from new graduates through to senior managers. The LIS Discipline Focus Groups were conducted in March 2004. Five sessions were held with a total of 49 participants taking part. The Generic Capabilities Focus Groups were conducted in late October/early November 2002. Six sessions were held with a total of 49 participants taking part. A break down of the participants profile for each series of Focus Groups can be found in Table 1. A spectrum of ages was represented with the participants' ages ranging from 24 to 56. Additionally, there was a wide continuum of LIS experience with participants' work history ranging from a few short weeks to 40 years. Reflecting the current female domination of the LIS profession the gender balance of participants was skewed to the female gender with only 3 males participating in the generic capabilities focus groups and 8 males participating in the discipline knowledge focus groups.

	Generic Capabilities November 2002	LIS Discipline Knowledge March 2004
Public/State Libraries	12	13
Special Libraries	14	19
Academic Libraries	15	13
LIS Educators	1	1
LIS Employment Services	2	1
Recent Graduates	5	2
TOTAL PARTICIPANTS	49	49

Table 1: Focus Group Participant Profile

Generic Capabilities & Discipline Knowledge: A Definition

Establishing a clear and precise definition of *generic capabilities* and *discipline knowledge* was an important part of the research project. The following review of each concept informed the investigation:

- In recent years there has emerged a growing interest within the higher education sector to help students develop life skills that can allow them to “function across different cognitive domains or subject areas and across a variety of social, and in particular employment situations” (Bridges, 1993, p. 45). Skills such as problem solving, critical thinking, effective communication, teamwork and ethical thinking are all examples of the life skills in question. Together these life skills form the core set of workplace skills and abilities desirable in graduating students and new employees. They complement the discipline specific skills and professional knowledge

acquired by students through their university study. Within the literature many synonyms have been used to refer to this core set of skills. Such synonyms include ‘transferable skills’ (Atlay & Harris, 2000), ‘key competences’ (Mayer, 1992) ‘generic skills’ (Oliver & McLoughlin, 2001) and ‘graduate attributes’ (Down, Martin, Hager & Bricknell, 1999). For the purpose of maintaining consistency within this paper the term *generic capabilities* will be used to refer to these skills and abilities.

- The taxonomy of discipline knowledge was articulated by Dressel and Marcus (1982). In this taxonomy, discipline knowledge can be characterised as having the following components:
 - Substantive knowledge: the concepts, facts, and types of problems dealt with by a discipline
 - Language and symbols: the terms and representation systems (linguistic, mathematical or symbolic) used to communicate in the discipline.
 - Structure: the organisation of knowledge within a discipline, including methods of thinking and problem solving; methods of collecting, analysing and interpreting information; and conventional methods of communicating
 - Values: the beliefs that guide our decisions about which problems to solve, the methods to choose and how evidence is evaluated
 - Relationships to other disciplines: the principles that determine how a discipline is related to other disciplines, largely determined by the other five components.

In discussing the curriculum developments in Dutch LIS schools, Roggema-van Heusden (2004) refers to ‘specific expertise’ which is defined as the “necessary knowledge and experience and insight relevant to the invariable aspects of the problem” (p. 99). Many synonyms can be used to refer to this core set of skills. Such synonyms include ‘subject-specific knowledge’, ‘content knowledge’ or ‘subject matter expertise’ For the purpose of maintaining consistency within this paper the term *discipline knowledge* will be used to refer to these skills and abilities.

Preliminary Results:

The two initial lists of workplace skills and core discipline knowledge were well received by the members of the Queensland LIS community who participated in the focus group sessions. While each focus group tended to draw on specific themes of interest to that particular group of people, there was also a great deal of common ground. In particular all groups, regardless of whether they were focusing on generic capabilities or discipline knowledge, clearly articulated the importance of generic capabilities in combination with discipline knowledge for a successful LIS professional. In fact, many of the focus groups charged with discussing discipline knowledge found it challenging to focus only on this one area without discussing the generic capabilities. In short, the focus groups revealed quite clearly that the two areas of generic capabilities and discipline knowledge are quite significantly intertwined and interrelated and vital for success as a Library and Information Professional in the twenty first century.

Both sets of focus groups generated considerable debate and discussion. The key issues in the discussions are briefly outlined below.

Working through the list of ten **generic capabilities**, the groups found that:

- The emphasis on 'attitude' or 'ethos' rather than skill development within many of the generic capabilities.
- The inter-relationship between the various dimensions of the ten capabilities was noted and considered within the framework of the complexity of human nature and personality.
- Distinctions were made between capabilities which had an organizational focus (Management, Business Acumen, Teamwork, Information Literacy) and those which had a personal, individual focus (Self Management, Lifelong Learning, Ethics and Social Responsibility, Problem Solving, Critical Thinking).
- Information Literacy and Lifelong Learning should be viewed as separate concepts.
- Information Literacy is a critical issue for LIS professionals as it was seen to be absolutely central to professional activities in the Information Age, but a distinction was drawn between the personal level of information literacy abilities and a job-related level of information literacy to communicate this to clients or users.
- The concept of Lifelong Learning was viewed as a higher level capability, with all other capabilities feeding Lifelong Learning.
- Team work was considered essential to all positions. While there was general agreement about the importance of oral and written skills, there were views that as the lines between media and modes of communication were blurring, there was scope to consider a multi-modal model of communication which would encompass current and future developments in communication.
- Ethics and Social Responsibility were considered central to LIS professional activities, particularly in the public library context. The professional framework of standards and position statements was seen as important, although this raised the question of whether it was consequently a discipline area.
- Management was discussed at the greatest length and raised the most issues for participants, especially in terms of whether the term referred to 'Management' as a hierarchical managerial process, or 'management' in the broadest sense of being able to manage one's life and one's affairs within the work environment. There were associated concerns about the 'discipline versus generic' nature of the capability. It was felt that many aspects of the Management capability were integral to other capabilities on the list. A new heading of 'Project Management' was suggested as more adequately reflecting the true meaning of the concept.
- Problem Solving and Critical Thinking were viewed as interrelated, but were still distinctive in many ways and should be separate capabilities. These skills were seen to be integral to university education and could be applied in the workplace at a number of different levels.
- Business Acumen generated considerable discussion. The term was viewed critically, but the concept of understanding and working within the political culture of the organisation was acknowledged as valuable for employees.
- Self management was seen to be very important in terms of ongoing personal and professional growth, and as such, closely related to Lifelong Learning.

Issues about what was 'missing' were discussed, with considerable debate as to whether certain topics were 'discipline' or 'generic':

- Information Technology (IT) skills – were those part of the discipline knowledge for LIS professionals, or was IT a tool which underpinned all business processes in the library and

information centre? Furthermore, what was the distinction between IT skills and IT literacy?

- Teaching skills – these are increasingly important to LIS professionals. It was uncertain whether they fitted into the domain of Communication or Information Literacy, or in fact whether they were 'discipline' as they could be taught within the academic curriculum.
- Marketing/Promotion – an important issue for all participants. It was unclear whether this issue should sit: Management, Communication, Business Acumen.
- Customer Service – the service ethos should underpin all aspects of LIS work, but participants were uncertain whether it was a generic capabilities in its own right or skill within a broader capability.
- Client skills were mooted as a possible capability which could incorporate the concepts of User Focus, Customer Service, Teaching Skills.

Other issues that were also introduced as being of importance included: leadership, negotiation, research skills, motivation, creativity and innovation and emotional intelligence.

Working through the list of fourteen **LIS discipline knowledge**, the focus groups found that:

- The inter-relationship between the various dimensions of the fifteen (later to be refined to fourteen) fields of discipline knowledge was noted and considered within the complexity and diversity of the current and emerging roles and responsibilities of the modern day library and information professional. It was frequently discussed that 'Librarians' were more and more expanding their 'territory' and being asked to take on new positions and responsibilities that were not always seen as being part of a 'traditional librarians' role. Many participants spoke of the modern day 'Information Professional' as being someone who could, or should, possess the skills and knowledge to work as a librarian, a records manager, a web content manager, an instructional designer or whatever their professional opportunities and interests took them.
- The differing degrees of skill and expertise within the fourteen fields of discipline knowledge were noted. Many of the participants commented that there would be a differing level of competence required in some of the discipline knowledge areas (i.e. Management,) for a new graduate versus an experience industry practitioner. Continuing Professional Development and skill upgrading were seen as vital for current professionals.
- An understanding of the role and place of Information in Society was viewed as an important guiding philosophical framework for every LIS Professional. It was seen as important that every information professional, regardless of their position and their work context, must possess a sophisticated understanding of the world in which they, and their library, function. This includes the political, social, cultural and economic situations at both the local, national and global levels.
- Ethics and legal responsibility were viewed as central to LIS professional activities. Specific areas discussed included, privacy, confidentiality, censorship, intellectual property and copyright, codes of practice both of the profession and the organisation that the LIS professional is supporting. The legal aspects of licensing agreements were particularly emphasised.
- The LIS professional must acknowledge their role as manager.

As such an understanding of management principles including human resource management, budgeting, strategic planning, and political acumen are a vital knowledge base. There were concerns over the extent to which a new graduate entering the profession would require Management knowledge. However, there was some support for the importance especially in the special or one person library context.

- Information Organisation was viewed as a fundamental knowledge that underpinned all facets of the LIS professionals' activities.
- Information Services was seen as central to all positions. While there was general consensus about the importance of customer service, marketing, service design and evaluation there were views that as the LIS profession needs to be more aware of its role within the larger information horizon and acknowledge its competition – namely Google and the like. Service innovation and creativity were identified as being critical.
- Collection Development and Management was viewed as a core requirement within the LIS profession. Participants suggested that a holistic view of the area was essential for success and that this included an understanding of the publishing industry and the book trade generally as well as the ability to keep current with the latest technological innovations such as e-prints. It was seen as important that the LIS professional possessed negotiation skills and that they could interact successfully with suppliers and vendors. Knowledge of preservation, conservation and disaster preparedness were identified as valuable. It was also felt that ethics and censorship had an important role.
- Information Resources and Retrieval was considered central to the LIS knowledge base. This encompassed a sound knowledge of available information resources, skills in online searching, the ability to critically evaluate reference tools. The importance of the reference interview was highlighted with specific focus on emerging digital environments such as chat and email. The service aspect or client focus of reference work was emphasized.
- The educative role of LIS professionals was acknowledged with many of the participants indicating that they or their colleagues have undertaken studies in the area such as the Certificate IV in Workplace Training or a Graduate Certificate in Higher Education.. Information Literacy, or more importantly, the ability to foster information literacy skills in others was seen as a core LIS discipline requirement in all areas of industry (public, special and academic). Areas identified included contemporary learning theory, instructional design, information literacy models, lifelong learning. The importance of one-on-one, group and virtual learning were emphasised.
- Information Management and Knowledge Management were viewed as interrelated. The participants suggested that whilst Knowledge Management was seen as an important concept it was merely representing a component of the broader area of Information Management and as such the two concepts should be combined under the area of Information Management.
- Participants agreed that the LIS professional should possess a firm understanding of the information technology environment that they are functioning within or could be functioning within in the immediate future. The LIS practitioner needs to be able to 'talk the talk' with the many information technology services and providers they will have frequent contact with. Risk management was identified as an area of

importance.

- Web content management was viewed as a key growth area for the profession. Areas of importance included web page design and construction, metadata, human computer interaction, and the legal and ethical issues pertaining to hosting web content.
- Participants unanimously agreed that LIS professionals should possess knowledge of the recruitment process from both sides – as employer and as future employee. Areas identified included employment seeking strategies and career planning such as responding to selection criteria, conducting job interviews and creating and maintaining a professional portfolio. Knowledge of the professional association and actively engaging in professional development activities including establishing and maintaining a professional network were discussed. Reflective practice was identified as being a crucial element to success.
- Records Management and Archives was seen as a growth area for the profession. A basic understanding of the core aspects of records management was viewed as desirable for new graduates entering the profession. With the view that practitioners requiring a more in-depth knowledge could undertake further training.
- Research skills were seen by participants as being desirable in two ways. Firstly, to improve status and to move the profession forward by creating and evolving a professional body of knowledge based upon rigorous methods of inquiry. This was seen as emanating from those professionals who chose to complete formal academic qualifications (i.e. Masters by Research or PhD). It was also generally agreed that academic research should be more strongly encouraged within the profession. Secondly, research in practice was seen as a way in which industry practitioners could undertake better decision making, develop best practice and establish benchmarking. The ability to write successful grant applications was also identified.

Issues about what was 'missing' were discussed, with once again, considerable debate as to whether certain topics were 'discipline' or 'generic' arose. Whilst no LIS Discipline areas were identified as missing from the list per se, the importance of generic capabilities for the LIS professional was further emphasised with participants identifying the following as being of importance to a modern day library and information professional:

- Time management
- Marketing
- Customer service skills
- Communication
- Presentation skills
- Liaison skills
- Political skills
- Project management
- Teamwork

In addition, it was also suggested that 'subject discipline' may becoming more and more important. Participants commented that in fields such as law or medicine a generic LIS qualification was perhaps not enough, with LIS professionals working in these fields needing to develop or acquire skills and knowledge unique to that field.

The initial lists of skills and knowledge identified from the literature review were re-examined in light of the comments and

suggestions that emerged out of the focus group sessions. A new collection of generic capabilities and discipline knowledge were developed. The terms and definitions developed on the revised list are based on the original terms and definitions extracted from the literature review. It is important to note that this new list is in a preliminary form and is still undergoing further examination.

Nonetheless the list clearly reveals the complexity and richness of skills and knowledge required by the library and information professional in the twenty-first century. A breakdown of the skills and knowledge essential to the library and information professional within these two areas is provided in Tables 2 and 3.

	Fields of discipline knowledge	Scope of field
1	Information and society	The role of information in society as a social, cultural and economic motor.
2	Ethics & legal Responsibility	The study of : <ul style="list-style-type: none"> • ethical considerations that arise in the storage, processing, retrieval and use of information and information systems • standards of conduct for information professionals in the performance of their duties • legal issues that apply in relation to the storage, processing, retrieval and use of information and information systems.
3	Management	The study of management theories and the basic principles of management as they apply to libraries and information centres.
4	Information organisation	The study of the description and organisation of information resources to facilitate information access and retrieval
5	Information services	The study of the design and delivery of relevant and efficient information services.
6	Collection management & development	The study of the activities associated with the development and management of, and access to, library and information resources.
7	Information resources and retrieval	The study of the theory and practice of reference and information services.
8	Information literacy instruction	The study of information use theory, contemporary teaching theory and instructional design.
9	Information management	The study of: <ul style="list-style-type: none"> • of management principles to the acquisition, organisation, control, dissemination and use of information relevant to the effective operation of organisations. • knowledge within the context of an organisation, including information and knowledge creation, codification, sharing and learning.
10	Information systems for library and information professionals	The study of the application of computer-based systems in libraries and information centres.
11	Web content management	The study of the design and management of Internet and intranet sites.
12	Career planning skills	An understanding of the skills essential for successful career planning including employment seeking strategies and career planning.
13	Records management and archives	The study of the application of management principles to the control of an organisation's records. The study of the management and control of records that are judged to have permanent value.
14	Research	The generation of knowledge through the ability to systematically gather and analyse data to advance library and information science theory and its application to the provision of information services.

Table 2. The LIS discipline knowledge required by the Library and Information Professional of the Twenty First Century.

	Generic Capability	Description
1	Information Literacy	Information Literacy is the ability to recognize when information is needed and being able to locate, evaluate and use effectively the needed information.
2	Lifelong Learning	Lifelong Learning is the ability to learn how to learn in all facets of life (i.e. professional, personal and educational).
3	Teamwork	Teamwork is the ability to work effectively with others in a group with the view to achieving defined goals. Two distinct roles necessary for teamwork are the team member and the team leader. A team member makes a productive contribution to the collaborative effort of the group by participating in the pursuit of group goals under the guidance of the team leader. The team leader makes a productive contribution to the collaborative efforts of the group by providing guidance to ensure desired goals are met.
4	Communication	Communication is the ability to exchange feelings, ideas and information with others in an appropriate manner. Communication consists of the two key aspects of oral and written skills. Oral communication involves using the human voice to effectively articulate a message to an intended audience. Written communication involves using text or graphics to effectively transmit a message to an intended audience.
5	Ethics and Social Responsibility	Ethics and Social Responsibility relates to an awareness of the need for and commitment to the maintenance of high professional standards and social justice.
6	Project Management	Management is the ability to plan and to achieve desired goals to meet specified standards and criteria or to adapt to a changing environment through the effective co-ordination of available resources.
7	Critical Thinking	Critical Thinking is the ability to reach conclusions through reflection and evaluation by applying independent thought and informed judgement.
8	Problem Solving	Problem Solving is the ability to find effective solutions to problems through creative reasoning.
9	Business Acumen	Business Acumen is the ability to understand and contribute to the corporate culture and the business environment of the parent organization.
10	Self Management	Self-Management is the willingness and ability to develop a mature and balanced understanding of self. The ability to apply reflective practice to support ongoing personal and professional growth will enhance individual strengths and minimise weaknesses.

Table 3. The generic capabilities required by the Library and Information Professional of the twenty-first century.

The Double Helix Of The Information Professional: A Discussion

Extrapolating from the work by Watson and Crick, the current authors propose that the two aspects of generic capabilities and discipline knowledge are, like the strands within the double helix, intertwined and complementary and together form the “unique patterns of DNA” (Watson, 1981) that determine the specific characteristics and qualities of the library and information professional. Figure 1 provides a schematic illustration of the double helix of the information professional (adapted from Watson, 1981). The two ribbons symbolise the two core areas of skill and knowledge – generic capabilities and discipline knowledge.

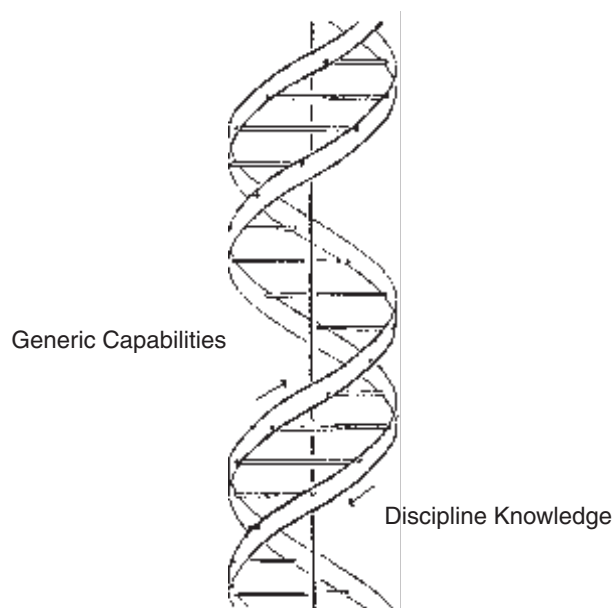


Figure 1: The double helix of the Library and Information Professional

Adapted from Watson(1981)

DNA contains the coded instructions, or genes, that are needed to construct the human body. While the genes of each human being are very similar, there are also some differences or variations that ensure that we are not all identical. It is estimated that 99.9% of our genes are identical to the genes in other human beings, but the remaining 0.1% results in the distinctions and differences that, when combined with environmental factors, make us all individuals. So, while the DNA of the library and information professional is composed of the intertwined strands of discipline knowledge and generic capabilities, the field of application for the knowledge and skills is broad ranging. The profession needs the variations of dominant and recessive genes, plus the 0.1% distinctiveness, to provide the individual traits of the profession. While there are some similarities between the role of rural public librarian, for example, and the role of the corporate information manager, it is the variations in the 'genetic makeup' of the information professionals that produces the richness and diversity. It could be inferred that the 'genetic makeup' of individual professionals "depends on their formal qualifications, work experience, professional development, and the role they perform" (ALIA, 2003, para. 6).

The research is significant because it develops a new framework through which to view the modern day LIS professional. The framework has implications for the current and future directions of LIS education in Australia. Over the years much has been written on the development and changes necessary in LIS education if it is to remain dynamic and responsive to the evolving information age and to ever-changing marketplace demands. In 2001 Ross Harvey commented on the quality of Australian LIS education in his provocative article, where he stated "something's amiss with university-based education for librarianship in Australia" (p. 15). Harvey suggested that those involved in library education need to consider three fundamental questions: What is our field? What is our product? Where's the quality? Ultimately what Harvey is proposing is that now is the time for LIS education to re-examine and reinvent itself if it is to remain relevant in an ever-changing information age. Two years later Harvey and Higgins (2003) continued this discussion via an exploration of the "unresolved tensions" experienced by the current LIS education in Australia. Harvey and Higgins suggest that the profession is complex and ever-changing and as such does "not speak with one voice about the attributes and skills it expects new graduates to have". Consequently, "LIS educators often feel that they are walking a tightrope as they attempt to accommodate the demands of the profession with their own perceptions of what content is needed in the curriculum" (p. 154). In that same year Myburgh (2003) argued that a "fresh approach needs to be taken concerning the education and development of the New Information Professional (NIP)". Myburgh contends it is urgent that there is a suitable response from LIS educators to the growing change within the LIS profession. In short, Myburgh challenges library education to provide "the necessary skills with which they [the graduates] can gain employment upon graduation, as well as the vision and understanding which might help them cope better with the rapidly changing world in which we live" (2003, p. 225). The preliminary findings of the current research will assist LIS education in meeting this challenge.

Extending on from this the research has a significant impact in the area of lifelong learning or Continuing Professional Development for the Australian LIS industry. Over the years more and more interest has arisen within the Australian LIS community on current professionals keeping their skills and knowledge up-to-date. In evidence of this is the ALIA CPD programme which was launched

in 2000. "The dynamic environment of the library and information sector dictates the need for library and information professionals to remain flexible and adaptable to change... Lifelong learning extends and develops the knowledge, skills and competencies of practitioners. It also enables them to prepare for their work more effectively, to broaden their careers and to undertake new tasks" (ALIA, 1999, para. 2-3). Significantly, the distinction is made in the program between the necessity of developing both *LIS Specific Areas* and *Generic Area*. The former refers to discipline specific concepts such as information resources, resources acquisition and management. The latter refers to skills such as team membership, effective communication, critical and evaluative thinking.

It has become apparent that library educators and CPD providers must not lose sight of the need for LIS students, and industry professionals, to have access to educational programmes that will equip them with both discipline knowledge and workplace skills. The challenge is determining the best approach in achieving this to ensure quality development of the profession so as to maximize the future potential for the industry – an issue which is outside the scope of the current paper.

Limitations Of The Research

The research is limited by its use of only the LIS community in South East Queensland. Stewart and Shamdasani (1990) point out that "the small numbers of respondents that participate even in several different focus groups and the convenience of most focus group recruiting practices significantly limit generalisation to a larger population" (p. 17). As such, a significant potential limitation of the current research is the extent to which the findings can be extrapolated from the South East Queensland LIS community to the LIS community as a whole.

An additional limitation of the research lies in the study being conducted by LIS educators. During the focus group sessions (which were held at the Queensland University of Technology campus) some of the participants found it challenging to focus their discussion on the "skills and knowledge required by the modern day LIS", instead of commenting or critiquing the LIS course at QUT or LIS courses in Australia generally. Whilst participants were informed at the beginning of the session, and reminded throughout the focus group process that this was outside of the scope of the current research, this may have influenced their thinking.

Future Research

The research project outlined in this paper will help LIS education and LIS profession further respond to the questions posed by Harvey: What is librarianship, or information studies? What skills and attitudes make for successful practice? Do Australian graduates in LIS possess these skills and attributes? (Harvey & Higgins, 2003, p. 152). Further research expanding on the current studies findings is needed. In particular, the following are recommended:

1. The research participants for the current study were drawn from the South East Queensland LIS community. Consequently, the current profile of skills and attributes for the library and information professional has limited generalisability. Further research involving other LIS communities in Australia is highly recommended.
2. The Australian Library and Information Association (ALIA)

is responsible for establishing and maintaining quality in the LIS profession in Australia. If the findings from the current research are to have a place in informing the Australian LIS community including the library education, then critique of and commentary on the findings from ALIA is vital. To date the study's findings in the area of generic capabilities has been presented to ALIA and have been used to inform the work being undertaken by the Library and Information Studies Education for the Knowledge Age (LISEKA) working party (Hallam & Partridge, 2003).

3. LIS education in Australia should consider the implications the studies findings have for current and future LIS Education. Does the LIS education in Australia produce the LIS professionals for the twenty-first century with the skills identified by the LIS industry and marketplace as 'essential'?

Conclusion

The current research has identified the skills and knowledge required by the library and information professional for the twenty-first century. Extrapolating from the work by Watson and Crick in the field of genetics it is proposed that there is a 'unique pattern of DNA' which determines the specific characteristics and qualities required by the library and information professional for modern age. Building on the double helix image of human DNA, the DNA of the information professional, consists of two intertwined and complementary strands. These strands incorporate discipline knowledge and generic capabilities, which together make up the genome of the successful information professional in the information age. The research is significant because it establishes an open dialogue between current industry professionals, library science educators and the professional association on the traditional and evolving skills and knowledge required by information professional in the twenty-first century. The dialogue will guide the development of current and future education of library and information professionals.

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KEYWORDS

Skills, Generic Capabilities, Discipline Knowledge, Information Professional, Librarian, Library Science education, Educating the Smart Professional, Curriculum development

Footnotes

- ¹ Title is based upon the work by James D Watson (1968) "The Double Helix: A Personal Account of the Discovery of the Structure of DNA". James D Watson was one of the two researchers who, in 1953, published the structure of DNA.